

Appl. No. 09/944,091
Response dated September 12, 2003
Reply to Office Action of May 15, 2003

REMARKS

Disposition of the Claims

The Examiner has rejected Claims 1-12 and 16-19 under 35 U.S.C. §103(a) as being unpatentable over Debbage et al., U.S. Patent No. 5,762,885, in view of Moore et al., EP Patent No. 0609813 A1.

The Examiner has rejected Claims 13-15, 20 and 21 under 35 U.S.C. §103(a) as being unpatentable over Debbage et al., U.S. Patent No. 5,762,885, in view of Moore et al., EP Patent No. 0609813 A1 as applied to Claims 1-12 and 16-19 above, and further in view of Courty et al., U.S. Patent No. 4,088,736.

Applicant appreciates the Examiner's withdrawal of the previous rejections under 35 U.S.C. §102 (b) of Claims 1-7, 16-19 and 21 as being anticipated by Debbage et al., U.S. Patent No. 5,762,885 and under 35 U.S.C. §103(a) of Claims 8-15 and 20 as being unpatentable over Debbage et al, U.S. Patent No. 5,762,885, and Courty et al., U.S. Patent No. 4,088,736.

Summary of the Invention

Before considering the art rejections, it is believed that a brief review of the present invention will be helpful.

Applicant has discovered a process for using a syngas stream to regenerate a catalyst/absorber system. In particular, a portion of a syngas stream produced in a gasification unit is used to regenerate a catalyst/absorber.

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In a preferred embodiment of the present invention, the syngas stream is cleaned prior to being used to regenerate the catalyst/absorber. More specifically, a portion of a syngas stream, which is the product of a gasification process, is cleaned in an acid gas removal unit to remove H_2S . The syngas is then processed in a shift unit where the carbon monoxide and any COS present in the syngas are converted into hydrogen, carbon dioxide, and H_2S . The shifted syngas is then processed in a zinc oxide bed where trace amounts of H_2S are removed. The resulting, treated syngas stream is rich in hydrogen and carbon dioxide. The syngas stream is then used to regenerate a catalyst/absorber system which is used to remove NO_x and SO_x from a turbine exhaust gas stream. The turbine exhaust gas stream is the remaining syngas that is the product of the gasification process.

35 U.S.C. §103(a) Rejection of Claims 1-12 and 16-19

Reconsideration and withdrawal of the 35 U.S.C. §103(a) rejection of Claims 1-12 and 16-19 as being unpatentable over Debbage et al., U.S. Patent No. 5,762,885 in view of Moore et al., European Patent No. 0609813 A1, are respectfully requested.

Debbage et al. discloses an apparatus for removing contaminants from a gaseous stream by the use of a catalyst absorber. Debbage et al. discloses regenerating the catalyst absorber by use of a reducing gas (see column 4, lines 27-35, 43-67 and column 5, lines 1-32). As the Examiner correctly states, "Debbage et al. does not teach regenerating the catalyst absorber with a regeneration stream of synthesis gas produced in a gasification unit." Debbage et al. teaches regeneration of the catalyst absorber in a manner that is completely different from the method of regeneration of the present invention.

Debbage et al. teaches using a regeneration gas that is produced in a two-step process wherein natural gas is mixed with air and passed across a nickel partial oxidation catalyst and wherein the gas is mixed with steam and passed over a shift catalyst. Furthermore, Debbage et al. does not even suggest that synthesis gas may be used as a catalyst absorber regenerating stream. Contrarily, the presently claimed invention teaches using synthesis gas from a gasification unit to regenerate spent catalyst absorber. Clearly, Debbage et al. falls short of teaching or suggesting the presently claimed invention and does not appreciate or recognize the use of syngas as a catalyst absorber regenerating stream because it does not disclose or suggest regenerating a catalyst absorber with a treated syngas stream.

The invention in Moore et al. relates to a method for producing fuel gas and a liquid product containing one or more oxygenated organic compounds from a synthesis gas comprising hydrogen, carbon monoxide, carbon dioxide and one or more sulfur-containing compounds. Specifically, the method comprises contacting a portion of the synthesis gas in an absorber system with an absorber liquid feed comprising one or more of these oxygenated organic compounds, and withdrawing a treated synthesis gas having a reduced concentration of the sulfur containing compounds and carbon dioxide. The treated synthesis gas is reacted in a catalytic reactor system to yield a reactor system liquid effluent containing one or more oxygenated organic compounds and a stream of unreacted synthesis gas. Simply stated, the synthesis gas in the invention of Moore et al. is used to make an oxygenated organic compound. Moore et al. discloses a system that comprises an absorber, a reactor and a stripper (see Figure 1) that are used to make the oxygenated organic compound. By contrast, the Applicant's presently claimed invention is related to a process of regenerating a catalyst absorber with a regeneration stream of synthesis gas that is produced in

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a gasification unit. In complete contradistinction thereto, in Moore et al., the absorber, a portion of synthesis gas, which may be provided by the gasification process or produced from light hydrocarbons (see p. 3, lines 29-32), contacts with a cooled stream of an oxygenated organic liquid which absorbs sulfur compounds and carbon dioxide from the syngas (see p. 3, lines 37-40) for subsequent introduction into the reactor where the syngas is converted into an oxygenated organic liquid by means of a catalyst. In contrast to the presently claimed invention in which a unitary catalyst absorber is being used to remove gaseous pollutants from combustion gases, the use of a catalyst absorber as such is not even remotely suggested in the Moore et al. reference. Instead, Moore et al. uses an absorption medium, i.e., the oxygenated organic liquid, in absorber 101 to remove sulfur compounds and carbon dioxide from the syngas and uses a catalyst totally separate and apart from the absorption medium in a separate vessel, the reactor, not to remove gaseous pollutants but rather to react *clean* syngas to form oxygenated organic liquid. It is noted and stressed that the entire thrust of the Moore et al. reference is to provide and introduce a clean syngas to come in contact with the catalyst. In complete contradistinction, the thrust of the presently claimed invention is to regenerate a catalyst absorber whose function is to contact *dirty* combustion gases so as to remove the gaseous pollutants.

Clearly, the catalyst in Moore et al. is not being used in the same way in which it is used in the presently claimed invention. It is impermissible and inequitable for the Examiner to equate a catalyst that is functioning to make oxygenated organic liquids with a catalyst that is used to remove pollutants from a turbine exhaust gas (see Applicant's specification at pp. 9-10).

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In the Office Action, the Examiner alleges that "Moore et al. continues to teach wherein catalyst poisoning is prevented by absorbing acid gases, such as sulfur-containing compounds by *regeneration with a synthesis gas*."

Since the Moore et al. reference is totally silent as to the use of a catalyst absorber such as the one utilized in the presently claimed invention, it is manifest that there is absolutely nothing in the Moore et al. reference about regenerating such a non-disclosed catalyst absorber. Indeed, nowhere in the entire Moore et al. reference is there any teaching or suggestion as to the need to regenerate the catalyst that is used in Moore et al., much less, how such regeneration is to be carried out. Perforce, there is nothing in the Moore et al. reference that teaches or suggests that syngas is to be used as a regeneration medium for such catalyst. This is understandable since syngas is what is being converted by the catalyst into an oxygenated liquid.

The only regeneration that is discussed in the entire Moore et al. reference is that of the oxygenated liquid being regenerated by having the sulfur and carbon dioxide impurities removed in stripper 109 by the use of syngas. The process of stripping these impurities from an oxygenated liquid with the use of syngas in no way even remotely suggests to one skilled in the art that syngas may in any way be used to regenerate a catalyst absorber.

In this connection, it is noted that the Examiner has stated that "the catalyst, reactor type is not critical to the invention, therefore a catalyst absorber system having an oxidation catalyst for treating acid gases would have been obvious to one of ordinary skill in the art, since the reactor type is not critical to the invention as taught by Moore". Applicant takes strong exception to this statement and respectfully traverses. What Moore teaches is that for purposes of *his* invention,

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"the catalyst, reactor type, and reaction chemistry are not critical to the present invention and comprise known technology." All that Moore needs is that "the catalyst and reactor system are [to be] selected to produce any oxygenated organic liquid of choice". Moore et al. does not teach or suggest that there is any equivalency between a catalyst used to convert a syngas into an oxygenated liquid and a catalyst absorber used to remove gaseous pollutants from combustion gases. Most importantly, as noted above, the Moore et al. catalyst cannot tolerate any sulfur or carbon dioxide impurities for fear of catalyst poisoning whereas the catalyst absorber of the presently claimed invention is specifically directed to remove such and other impurities from combustion gases.

Still further, Applicant also respectfully traverses the Examiner's allegation that it would be obvious to one of ordinary skill in the art to modify the teachings of Debbage et al. "by regenerating a catalyst absorber system with synthesis gas, because Moore et al. teaches a process for removing acidic gases from a gas stream, wherein synthesis gas is used as a regeneration stream from a gasification unit" and then concludes with the observation that it would then be obvious to "regenerate a catalyst absorber, containing acidic gases as taught by Debbage et al. with the synthesis gas as taught by Moore et al. The Examiner has combined isolated portions from the Moore et al. reference, taken out of context, and has combined those portions in a manner which is not supported by the Moore et al. reference itself. It is respectfully submitted that the Examiner is impermissibly disregarding material portions of the references much to the detriment of Applicant. The Examiner has adopted a legally erroneous approach in seeking to combine isolated portions of the references, taken out of context, while disregarding other equally or more important portions whose effect is to lead one skilled in the art away from the claimed invention. The entirety of the reference must be considered in determining the scope and content of the prior

art, and in ascertaining the differences between the art and the subject matter claimed. References must be considered as a whole even where the rejections are based on a combination of such references. It is not within the framework of 35 U.S.C. §103 to pick and choose from the prior art only so much as may be thought to support a holding of obviousness, to the exclusion of other parts necessary to the full appreciation of what the prior art conveys to one skilled in the art. Here, the Examiner has erred by not properly characterizing the Moore et al. process steps.

In particular, in Moore et al., the acidic gases are removed from a syngas stream by oxygenated liquid, not by a catalyst absorber as recited and required by the presently claimed invention. The removal of acidic gases by any other means is not what is being claimed in the present invention. The fact that Moore et al. does teach that syngas may be used much later in the process to strip those acidic gases from the oxygenated liquid is totally remote from the presently claimed invention. Regenerating the oxygenated liquid with a syngas is not what the presently claimed invention requires. In the presently claimed invention, the catalyst absorber removes impurities from combustion gases. In Moore et al., it is the oxygenated liquid that removes impurities from syngas. In the presently claimed invention, the catalyst absorber is then regenerated by means of syngas. In Moore et al., the only regeneration that is discussed is that of the oxygenated liquid by means of syngas. The Examiner, based on these two disparate steps, concludes that it would be obvious to use syngas to regenerate the Debbage et al. catalyst absorber. Regenerating an oxygenated liquid by stripping with syngas does not suggest regenerating a catalyst absorber with syngas. There is no motivation or suggestion within either the Moore et al. or the Debbage et al. references, whether considered alone or in combination, which would in any way even remotely suggest to one skilled in the art that it would in any way be

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possible, much less, desirable to regenerate the catalyst absorber disclosed in Debbage et al. by means of the syngas disclosed in Moore et al. Indeed, when the references are properly considered as a whole, the only teaching that one skilled in the art can glean from the combination of references is that syngas may be used as a stripping medium to remove acidic gases from an oxygenated liquid and, moreover, that in order not to poison the catalyst disclosed in Moore et al., it is necessary to clean the syngas by removing acidic gas by means of an oxygenated liquid. There is nothing in the combination of references that would lead one skilled in the art to utilize syngas as a regeneration medium for a catalyst absorber. Only Applicant's own disclosure provides any such teaching and, of course, cannot be used as a reference against him.

In short, even when the references are combined in the manner that the Examiner has done, the combination still does not teach or suggest the presently claimed invention. The process steps that the Examiner has urged are present in the Moore et al. reference simply do not suggest that which the Examiner alleges to one skilled in the art, when the references are properly considered as a whole, which the Examiner has clearly not done. It is respectfully submitted that this rejection runs afoul of a basic mandate inherent in Section 103, that a piecemeal reconstruction of the prior art in light of Applicant's own disclosure shall not be the basis for a holding obviousness.

It is respectfully submitted that the Examiner errs in combining prior art as if Applicant's own disclosure were included therein as part of the knowledge possessed by one of ordinary skill in the art. Clearly, this the Examiner may not do under Section 103. While it may be possible to select features from the various references and combine them with each other in order to attempt to arrive at Applicant's claimed process, there simply is no basis for making such

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combination disclosed or suggested in the cited references; only Applicant's own Specification suggests any reasons for combining these references. Under Section 103, that does not constitute a proper rejection. Most importantly, even when combined and no matter how they are to be considered, there is still absolutely nothing in the combination of references which would even remotely suggest to one skilled in the art that syngas from a gasification unit is to be used as a regeneration medium for a catalyst absorber.

In view of the foregoing, it is respectfully submitted that this rejection is untenable as a matter of law and should be withdrawn.

35 U.S.C. §103(a) Rejection of Claims 13-15, 20 and 21

Reconsideration and withdrawal of the 35 U.S.C. §103(a) rejection of Claims 13-15 and 20-21 as being unpatentable over Debbage et al., U.S. Patent No. 5,762,885, in view of Moore et al., European Patent No. 0609813 A1, as applied to Claims 1-12 and 16-19 above, and further in view of Courty et al., U.S. Patent No. 4,088,736, are respectfully requested.

With regard to Claims 13-15, these dependent claims incorporate all the limitations from which they depend. These dependent claims further disclose the manner in which the syngas stream is cleaned and are directed to the process of converting carbonyl sulfide to hydrogen sulfide and carbon dioxide.

The Debbage et al. and Moore et al. references have been discussed above. Nothing in the combination of Debbage et al. and Moore et al. teaches or suggests the use of a syngas stream to regenerate a catalyst absorber. Perforce, nothing in this combination of references teaches or suggests how

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such a syngas stream is to be cleaned prior to such an unsuggested regeneration step.

While Courty et al. discloses a process for purifying gas containing CO and or hydrogen and sulfur compounds, Courty et al. fails to suggest or teach that the purified gas stream could be used as a syngas regenerating stream that is used to regenerate catalyst absorbers. Therefore, it would not have been obvious to one of ordinary skill in the art to combine Debbage et al. and Moore et al. with Courty et al. in the manner in which the Examiner has done. Again, the Examiner has combined the references as if Applicant's own disclosure was a part of the prior art. This combination is impermissible. Without the benefit of the Applicant's own Specification, there is nothing in the cited art which would lead one skilled in the art to even combine these references, much less in the manner in which the Examiner has done.

Courty et al. does nothing to overcome the deficiencies of Debbage et al. and Moore et al. as discussed above and, as such, the combination of references does not teach or suggest the subject matter recited in the rejected claims.

With regard to Claims 20-21, independent Claim 20 is an alternative embodiment of the presently claimed invention and further narrows the invention of independent Claim 1. Specifically, Claim 20 describes regenerating the catalyst absorber with a regeneration stream of syngas produced in a gasification unit, the syngas also being passed through a shift reactor either before or after the acid gas removal unit, the shift reactor containing shift catalyst for conversion of at least a portion of any carbon monoxide contained in the syngas to hydrogen and carbon dioxide and conversion of at least a portion of any carbonyl sulfide contained in the syngas to hydrogen sulfide and carbon dioxide, the syngas then

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being processed in a zinc oxide bed. Claim 21 is dependent upon Claim 20 and incorporates all the limitations of Claim 21. Courty et al. fails to disclose or suggest processing of the regeneration syngas stream by conversion of at least a portion of any carbon monoxide contained in the syngas to hydrogen and carbon dioxide and conversion of at least a portion of any carbonyl sulfide contained in the syngas to hydrogen sulfide and carbon dioxide. Additionally, Courty et al. fails to disclose that the treated syngas stream can be used to regenerate a solid catalyst absorber. Therefore, it would not have been obvious to one of ordinary skill in the art to combine the Courty et al. reference with Debbage et al. and/or Moore et al.

One of ordinary skill in the art would not have been motivated to combine the references of Debbage et al., Moore et al., and Courty et al.; therefore, it would not have been obvious to one of ordinary skill in the art to combine these references.

In view of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of Claims 13-15 and 20-21 under 35 U.S.C. §103(a).

Conclusion

It is respectfully submitted that the rejections set forth by the Examiner either fail to anticipate or suggest the presently claimed invention. It is respectfully submitted that Applicant has shown that one skilled in the art at the time of the present invention, absent the teachings of the present application disclosure, would not choose only to view and consider the portions of the references which the Examiner erroneously contends he would, thereby disregarding the other

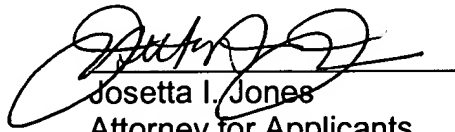
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portions which are also set forth therein and which Applicant submits are equally as important to understanding the references as a whole.

There is no suggestion of the presently claimed invention regardless of how the disclosures of the cited references are combined, when they are properly viewed as a whole. It is respectfully submitted that when these references are so viewed, and not in view of the disclosure of the present application, there is nothing disclosed or suggested which would lead one skilled in the art to make the wholesale modifications to the processes set forth in the references in order to arrive at the Applicant's claimed process.

For the reasons stated, Applicant submits that this application is in condition for allowance and notice to that effect is earnestly solicited.

Respectfully submitted,


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